The Tool Engineer

Vol. IV. No. 10.
February
1936

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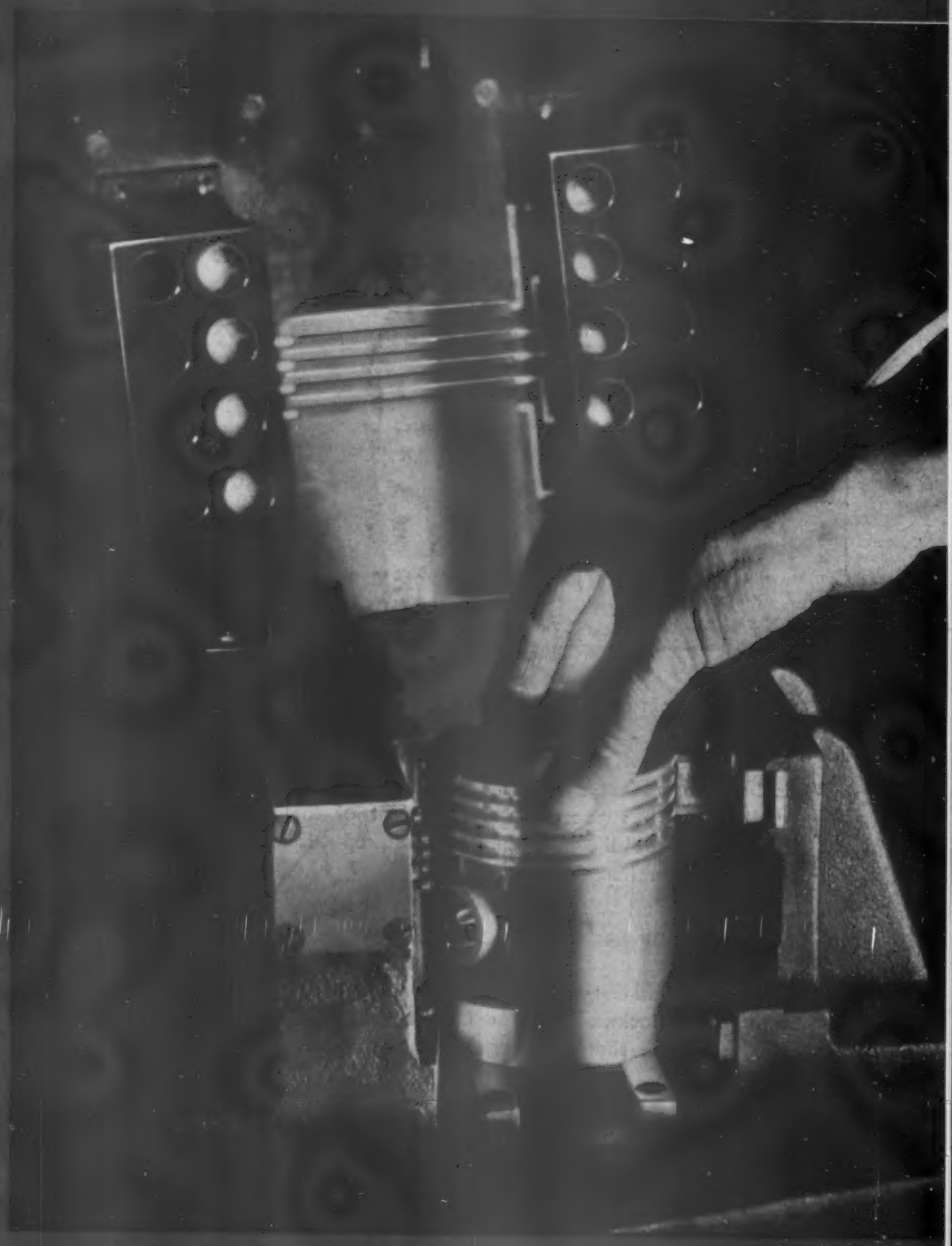
Importance of
Tool Engineering
to the
Automotive Industry

See Page 12.



"When the light is red, a variation may mean breakage." See page 28

Official Publication of the
AMERICAN SOCIETY OF TOOL ENGINEERS

Announcing

LONGER TOOL LIFE

LOWER PRODUCTION COSTS

SIMPLER RE-GRINDING

FEWER SEPARATE TOOLS

THE END OF BREAKAGE

MITCO PIN SPLICE TOOLS

AND A NEW MOUNTING METHOD

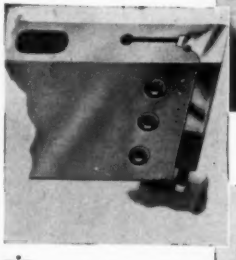
MITCO pin splice tools permit "grinding down" to a new edge far beyond the point where conventional tools would have to be scrapped. This is because perfect adjustment, positive clamping, and adequate support are independent of tool length. Thus tool life is lengthened and production costs sharply reduced.

The pin splice mounting method combines the advantages of both the dovetail and dowel methods, yet retains none of their disadvantages. As tools are ground down, "used" stock is replaced with filler blocks. Breakage is ended by eliminating the sharp corners of conventional dovetail tools.

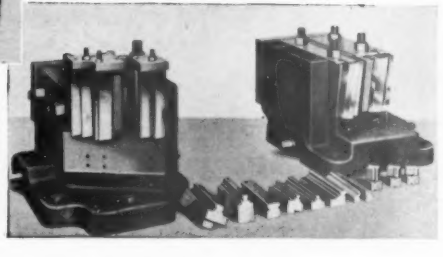
Grinding back the rake always restores correct cutter form. Thus it is possible to combine normally separate cutters in a single tool. On the other hand the design of MITCO pin splice tools permits their use in even the simplest form of lathe tool holders.

A folder describing and illustrating these tools in more detail is available for mailing on request. Ask for a copy.

(Right) MITCO Pin Splice Tools being used for turning, forming and cheeking a crankshaft journal.



(Left) Simple forming tool, showing clamping, filler block and support.



(Right) Complete set-up for rough and finish turning, cheeking and forming. Block at left for back of lathe. Foreground shows filler blocks and individual tools.

MICHIGAN TOOL COMPANY • DETROIT, MICHIGAN

THERE IS A DIFFERENCE

It shows up IN CUTTING SPEED

● Not only cutting speed, but *safe* cutting speed plays a large part in your small tool satisfaction. The ability of Morse Tools to maintain high cutting speeds safely and economically is one of the reasons why production and shop men everywhere say "there *is* a difference."

What assures this difference in Morse Tools? Years of experience in the making of precision cutting tools put one extra value behind the Morse trade mark. Another results from carefully controlled hardening, another from exceptional accuracy in grinding. Step-by-step inspection adds its part.

Next time you hear someone say that all leading metal-removing tools are alike, tell him to try Morse Tools. Tell him it will be worth his while in lower costs and better work to prove to himself "there *is* a difference."

A conveniently located Morse Distributor assures prompt service.

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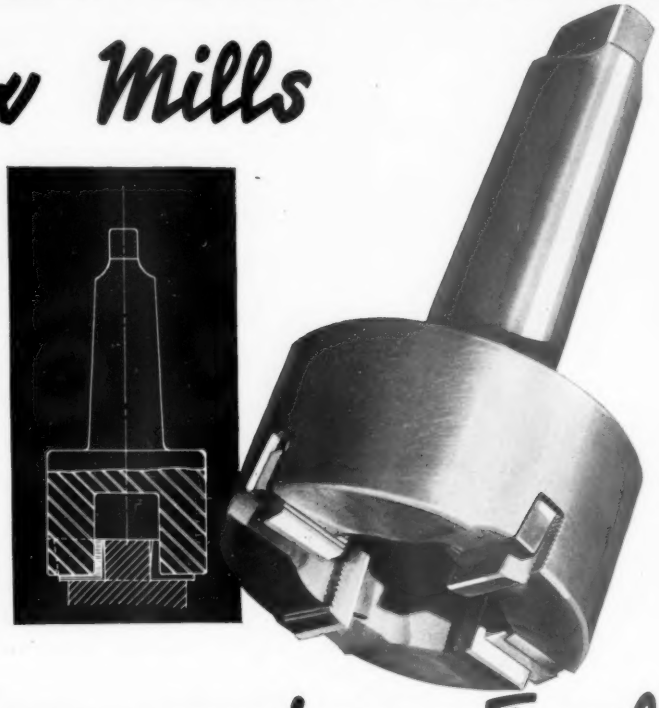
NEW BEDFORD . . . MASS., U. S. A.

New York Store: 130 Lafayette St. *Chicago Store: 570 West Randolph St*

INGERSOLL ~~ZEE~~ LOCK

Hollow Mills



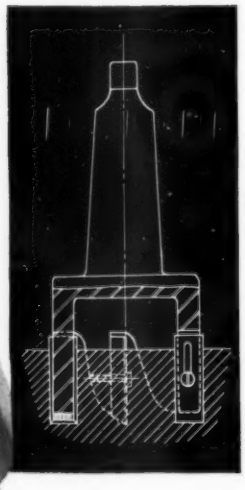
A Real Heavy Duty Adjustable and Renewable Hollow Milling Tool.

Ingersoll Zee Lock Cutter Blades are positively locked into a forged and heat treated alloy steel housing. The serrations are broached so that by reinserting the blade in the succeeding position, the blades may be moved inwardly a few thousandths and the cutter resized.

Body of Tool ground to size for piloting. Or furnished with piloting arbor or shell type for use on separate arbor.

Furnished with blades of plain or super high speed steel, J Metal Stellite or Cemented Carbide.

or Trepanning Tools



A Combination boring and hollow milling tool.

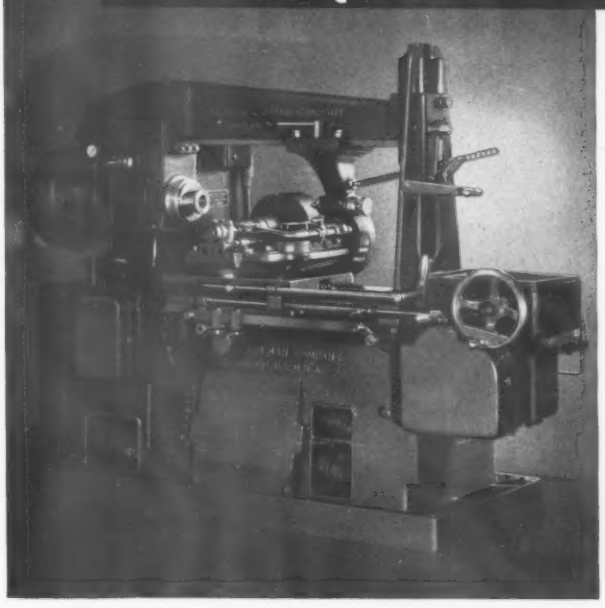
Only the narrow annular groove is reduced to chips effecting considerable saving in time and cutter cost.

Special Adjustable Serrated Blades are fitted into a forged and heat treated alloy steel housing. The blades are adjustable for wear and renewable when worn. Ground to distribute cut. Body relieved for maximum chip clearance. Made with plain body with shank as shown. Or with piloting body or with tapered hole for separate pilot or drill, or of shell type for use with separate arbor.

Send Ingersoll your tool engineering problems for free tool design information. You will find the Ingersoll Cutter Catalog full of data in regard to the use of all types of inserted blade cutters. Free on request.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS, U. S. A.

Accepted by Industry



The Barber-Colman Type A Hobbing Machine, shown at left, was received favorably by Industry when first placed on the market. That this popularity continues is indicated by the fact that we shipped nearly 100 Type A Hobbing Machines in 1935. While the majority of these went to the automobile and tractor industries for high-production work, a substantial number were delivered to other kinds of plants for broader applications. Industrial executives desiring lower costs and higher production on work that is now being hobbed, or which can be hobbed, are invited to investigate our Type A Hobbing Machine.

TAPER SPLINES—AND TYPE T HOBBING MACHINE

The taper spline presents a stronger, more reliable, more durable method of mounting machine members on shaft ends. Our new Type T Hobbing Machine, for taper splines and all other hobbing work, is growing rapidly in popularity. For testing in your own product, we will hob a taper spline on one of your shafts, and broach its mating part, without charge. Write, today, for list of hobs we have in stock for this purpose.

Complete Service

Barber-Colman Hobbing service is complete. It includes Hobbing Machines in a variety of sizes and types; Hobs, standard or special, with ground or unground contours; Engineering and Inspection Services that assure maximum efficiency and economy. Write, today, for details.

BARBER B-C COLMAN

PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

Detroit Representatives—HODGES MACHINERY CO., 544 New Center Building

The No. 2 Universal Tool and Cutter Grinder

A NEW universal tool and cutter grinder—the No. 2—which swings 12″ and takes 28″ between centers. Its universal work head takes 3½″ per foot and B & S tapers; mounts a face plate, three jaw chuck or face chuck; swivels and can be set at any angle in both vertical and horizontal planes; has separate graduations for setting clearance angles. Cylindrical, internal and surface operations are all performed with equal ease. And perhaps the outstanding feature of all is the ability to traverse the table by power—hydraulically.

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Worcester, Mass

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M-350A

NORTON GRINDERS AND LAPPERS

The Tool Engineer

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Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

Vol. IV. FEBRUARY, 1936 No. 10

Application blanks and information pertaining to membership in the American Society of Tool Engineers may be had by addressing *The Tool Engineer*, 2842 W. Grand Boulevard, Detroit, Michigan, or the Secretary's office, 31 Melbourne Ave. Detroit, Michigan. **Dues** are $5 iinitiation fee, $6 per year for senior grade membership and $3 per year for junior grade membership. Junior membership initiation fee $2.

The Tool Engineer is published on the first Thursday of each month. It is the official publication of the American Society of Tool Engineers, Incorporated. The membership of the Society and readers of this publication are practical manufacturing executives such as master mechanics, works managers, tool engineers, tool designers and others who are responsible for production in mass manufacturing plants throughthe nation and in some foreign countries.

Owing to the nature of the American Society of Tool Engineers organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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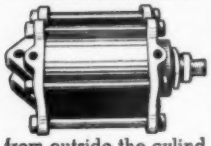
PNEUMATIC AND HYDRAULIC PRODUCTION TOOL EQUIPMENT

Which of these types fits YOUR jobs..?

★ AIR CYLINDERS



Stationary single acting and double acting types. Improved "Leak-Proof" construction with piston seal adjustable from outside the cylind r. A style and size for every use, for air pressures to 150 lbs.

★ AIR CONTROL VALVES

"Pack Less" bronze disc type, ground and lapped for perfect seal and long life without maintenance. A simple and dependable control valve, built in 3-way and 4-way types, hand or foot operated.

★ REGULATING VALVES

Accurate, sensitive piston type pressure regulating valves for compressed air and hydraulic services at pressures up to 250 lbs./sq. in. Improved design, finest construction.

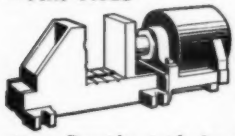
★ ARBOR PRESSES

Air operated presses, 600 to 60,000 lbs. capacity, with many exclusive Hannifin features of construction. 68 models to choose from, literally a style and size for hundreds of customary needs.

★ AIR CHUCKS

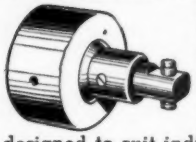
With exclusive Hannifin operating mechanism, simple and durable. For turret lathe, drill press, boring mill, and other applications, all sizes and styles for internal or external chucking.

★ AIR VISES



Many standard and special styles for milling machine, drill press, and assembling operations. Provide rigid clamping and high-speed operation for production jobs.

★ EXPANDING MANDRELS



Air operated, improved Hannifin design with "Leak Proof" operating cylinder. Many standard types and sizes. Special styles designed to suit individual production needs, upon receipt of specifications.

★ ROTATING AIR CYLINDERS

Double acting, for chuck operation. "Leak Proof" piston seal construction, adjustable from outside the cylinder. Maximum power, free movement, least air consumption, and sustained efficiency.

★ HYDRAULIC CYLINDERS

Double acting types for high-pressure services. No tie-rods. Universal end caps may be turned to bring inlet port at top, bottom or side. Improved piston ring seal. Many types.

★ HYDRAULIC PRESSES

Two, three, four column and open gap styles, and special designs of capacity and specifications to suit individual requirements. Simple, effective designs for fast production.

★ HYDRAULIC PUMP UNITS

Self-contained hydraulic pump and automatic control units for individual power for hydraulic equipment. Compact, economical assemblies which simplify installation and operation.

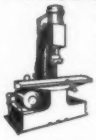
★ RIVETING PRESSES

Either portable or stationary high speed hydraulic units, with power units or for operation from central hydraulic system. Designed to suit production riveting operations—light or heavy work.

★ SPECIAL PRESSES

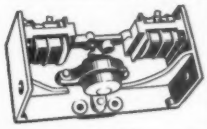
Both hydraulic and air operated platen presses, and other types for plastic moulding, rubber moulding, straightening, testing, forming, and other modern manufacturing operations.

★ PRODUCTION UNITS



Both hydraulic and air operated special manufacturing equipment designed to simplify and speed up standard operations. Recommendations given upon receipt of specifications.

★ SPECIAL CONTROLS



Hannifin electrically operated air control valves, and other special control equipment, including high-pressure pump and valve units for operation of standard or special hydraulic machinery.

★ SEND FOR NEW BULLETINS

Standard Hannifin equipment is described in Valve Bulletin No. 34, Hydraulic Cylinder Bulletin 35, Air Operated Press Bulletin 36, Air Chuck Bulletin No. 37. Send for copies, or consult Hannifin engineers for specific recommendations on standard or special air or hydraulic production tool equipment.

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DESIGNERS • MANUFACTURERS • *Pneumatic and Hydraulic Production Tool Equipment*

Detroit Office: **Hayward Building, 4829 Woodward Avenue, Telephone Columbus 4949. R. A. Bean, Manager**

FEBRUARY CHAPTER MEETINGS

CLEVELAND

THURSDAY, FEBRUARY 13, 1936—8 P. M.

at

CLEVELAND ENGINEERING SOCIETY, HANNA BUILDING

Technical Session

Speaker

Mr. E. W. P. Smith

Consulting Engineer, Lincoln Electric Company

A lecture on Welding of Built Up Jigs, Fixtures and Tools with a brief history of welding and its origin. This lecture will be a stereopticon lecture and should be of great value to all Tool Engineers and designers. Mr. Smith has made welding his life study and is a graduate of Colorado College.

All production engineers, superintendents and foremen, also guests of Tool Engineers are invited.

Watch for the March issue of *The Tool Engineer*. A speaker from the Cincinnati Milling Machine Company will be with us on March 12th. This wll be a stereopticon lecture on designing milling fixtures with cutting speeds and feeds. The name of the speaker will be announced in the next issue.

DETROIT

THURSDAY, FEBRUARY 13, 1936

at

HOTEL FORT SHELBY

Dinner 6:30 P. M.*

Technical Session 8:00 P. M.

Speaker: A. H. (Jack) Frost

Chief Automotive Engineer
(White Star Division) Socony Vacuum Oil Company

Subject: Modern Automotive Lubrication and Maintenance

Mr. Frost's lecture will give some of the results of recent developments in lubrication and maintenance of modern bearings and fits as affecting design. He will be assisted by Mr. C. D. Freeburn, Industrial Lubrication Engineer, who will be pleased to answer any questions relative to industrial coolants, cutting compounds and oils.

***Entertainment including an unusual motion picture film has been provided for dinner guests.**

PRODUCTION PERSPECTIVES

FROM the Tool Engineer's viewpoint business continues to look up. Nothing during the past thirty days indicates a particular decline in employment figures or any considerable lessening of production, although there is apparent just at the moment a **slight lull** in production schedules so far as the automotive industry is concerned. Along with forecasts of 15% greater business for machine tool builders and about 10% more business generally, for 1936, is a **general feeling of optimism** held by most men engaged **in Tool Engineering** in its many phases. Machine tool dealers are **receiving many inquiries** these days, but report that **not many orders** are being **placed** as yet. **Business** this spring **looks good to** most **manufacturers of equipment and tools** used in mass manufacturing. Just at present we have noticed a **demand for assembling machines** for use in automotive plants around Detroit. One Rockford, Illinois manufacturer of this equipment **reports brisk business** in this line, and since this type of equipment has been more or less neglected the past two or three years it seems to indicate a further effort at cutting unit costs and a cognizance of the value of this type of equipment.

Of the past eleven years, **1935 is said to have been Studebaker's best year.** The **"Top Five"** in volume of sales in the automotive industry, including Ford, Chevrolet, Plymouth, Dodge and Olds all **showed substantial gains in total registrations** for 1935 as compared to 1934. **Willys-Overland** receivers have applied for permission **to build 15,000 more units at Toledo.**

A. J. Brant, Inc. of Detroit, **has** an **option on** the **H. H. Franklin Automobile Manufacturing Company of Syracuse**, New York. From Springfield, Massachusetts we hear that the **Van Norman Machine Tool Company** has a **continued high volume** of production with prospects for a good first quarter in 1936. Other concerns in western Massachusetts, which were operating much below normal two years ago, are now busy as a result of the automotive revival. Some of these are the **United American Bosch Company of Springfield,** the **Norton Company** of **Worcester, Moore Drop Forging Company** of **Springfield** and the **Greenfield Tap and Die Corporation** at **Greenfield**—all report **well sustained operations in January.** The **Employers Association** of Western Massachusetts, with headquarters in Springfield, **report 16,002 employees in December, 1935,** in twenty-five metal working plants as compared to 16,352 in November and 13,727 in December, 1934, according to **A. R. Tulloch,** executive secretary of the Association. The **Chapman Valve Manufacturing Company** of **Holyoke** are now in production on a new gate valve which is **machined from solid steel bar stock.** In **Westfield,** Massachusetts **George Edson Shepard,** 62, Treasurer and Director of the **H. B. Smith Company,** passed on January 13th at his home following a three week's illness. Mr. Shepard's association with the Smith Company covered a period of about forty-five years, having started in a small capacity and subsequently rising to various offices until the last five years when he served as the Company Treasurer and Director.

From **Springfield, Vermont** we hear **Jones & Lamson, Fellowes Gear Shaper** and the **Bryant Chuck Company** are **all operating at practically full capacity.** The **greater demand** for lathes, milling machines and multiple drills is accredited to the **improved market for** automobiles and **farm machinery and export demand** has also played an important part in increasing production of numerous machinery manufactures. At **Bath, Maine** a **$500,000 contract** for the construction of **three Diesel-powered trawlers** for the Bay State Fishing Company was awarded the **Bath Iron Works** Corporation. Construction will begin with the arrival of material and **drafting room work will commence immediately. Diesel engines** developing 600 H. P. **will propel** the new **craft.**

At **Hartford,** Connecticut **Underwood-Elliott-Fisher Company,** manufacturers of Underwood Typewriters, is **building a plant addition.** Numerous **changes** are being made **in the main plant to facilitate production.** Hans Schweiger, President, Carl Schweiger, Vice President and Treasurer, and John R. Clark, Secretary, are incorporators of **Hartford Tool & Die Company,** Inc. **recently chartered at** 119 South Whitney Street, **Hartford. Farrel-Birmingham Company,** Ansonia, Connecticut has **reopened** a part of the **old Birmingham Iron Foundry in an expansion** of molding operations. Some molders and iron workers have been transferred to the plant, although Nelson Pickering, President of the Company, states that the move will affect no other divisions. **Machinery** of the Connecticut Electric Manufacturing Company, Bridgeport, is **being moved** to **Bantam** where it will be set up in the **fromer plant** of the **Trumbull-Vanderpoel Manufacturing Company.** The Bridgeport company, which is in receivership, was foreclosed, while **the new Company at Bantam** was **formed** by **Frank Alley,** former Works Manager of the Arrow-Hart & Hegeman Electric Company of Hartford. **Fafner Bearing Company, New Britain,** Connecticut, **paid** four quarterly **bonuses to its employees** during 1935. The amount of the bonus in each case was **5% or more** of each worker's earnings. Officers and salesmen did not participate in the award. **Robert B. (Bob) Skinner** has resigned as Secretary and Sales Manager of the Skinner Chuck Company, New Britain, **to become Vice President and General Manager** of the **D. E. Whiton Machine Company of New London.** Mr. Skinner entered the Chuck manufacturing business immediately upon leaving school and worked for sometime in the production departments of the Skinner Company. Descendants of two of the original chuck manufacturers are brought together by the association of Mr. Skinner and Mr. L. E. Whiton, President of the Whiton Company.

Increased demand for their piston rings and other products has necessitated the **Simplex Products Corporation at Cleveland** to **acquire greater manufacturing facilities** in a **new and larger plant** at 3830 Kelley Avenue. Cleveland will celebrate its Centennial June 27—October 4 with the Great Lakes

(Continued on page 20.)

P A T E N T S

INVENTION, NOVELTY, UTILITY AND ABANDONMENT

Second in a series presenting a concise, informative guide on the subject of patents.

By EVERETT G. WRIGHT
Patent Attorney
Detroit, Michigan
Member of the Michigan and Federal Patent Bars

General Considerations. In order to obtain a patent, the patentable subject matter must first have been "invented," the invention must be "novel," it must be "useful," and it must not have been "abandoned." Therefore, a knowledge of what is meant in patent law by invention, novelty, utility and abandonment is essential to a clear understanding of patents.

Invention. Invention is generally referred to as the mental conception of an idea or advancement in an art, and the reduction of the same to a tangible physical form or practice.

The courts, after applying a number of fixed principles or rules to the facts before them, determine by means of a process of judicial elimination whether or not invention exists. These principles are briefly stated as follows:

(a) The degree of invention is immaterial since invention lies in the conception of a basic art, machine, manufacture or composition of matter, and in each subsequent distinct improvement or advancement thereof.

(b) Invention does not necessarily depend upon the extent of the mental process of conception in that it may result from the exercise of great ingenuity, laborious effort and long experiment, or, it may be the product of a flash of thought or accidental discovery.

(c) The inventive act must be complete and sufficiently perfected so that reduction to practice may be accomplished solely by the application of mechanical skill without the further exercise of inventive faculties.

(d) It is not invention to produce by mere mechanical skill that which was obvious to those skilled in the art at the date of the alleged invention.

(e) It is not invention to substitute one material for another unless the material substituted performs a new function, provides a new mode of construction or operation, develops new properties or uses, or unless the material attains its first practical success in the art in which the substitution was made.

(f) It is not invention to enlarge, strengthen or to change the size, form, degree or proportions of a machine, manufacture or composition of matter, or to improve the same by mere perfection of workmanship.

(g) It is not invention to duplicate, omit or reverse parts of a machine or manufacture unless a new mode of operation, or new function, or unitary result is produced.

(h) It is not invention to substitute an equivalent for any part or element of a process, machine, manufacture or composition of matter.

(i) An aggregation or the mere assembly of a plurality of separate elements without changing their functions or without producing a new unitary result is not invention.

(j) The combination of old elements into a new device is not invention unless a new mode of operation is produced.

Novelty. Novelty in patent law is statutory newness or, in terms of the statute, an invention is novel if it was "not known or used by others in this country before his (the inventor's) invention or discovery thereof and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof." Whenever an invention lacks novelty it is said to have been anticipated.

An invention is anticipated when a single prior description, patent or structure is found which discloses all of the elements of the invention or equivalents thereof and which performss substantially the same function in substantially the same way. However, the disclosures in two or more prior descriptions, patents and/or structures may be combined to anticipate an invention where the result obtained from such combination would be obvious to those skilled in the art to which the invention relates.

Utility. Patentable utility resides in an invention if it is capable of performing at least one of the beneficial functions or uses claimed for it, providing, however, its function or use is not illegal or offensive to public health, safety or morals.

Abandonment. An invention becomes abandoned when the inventor voluntarily disclaims or otherwise relinquishes the right to patent his invention by certain acts or omissions to act which are inconsistent with an intention to obtain a patent. An invention, once abandoned, is dedicated to the public and the inventor cannot later re-establish his rights thereto and obtain a patent therefor.

The abandonment of an invention is a question of fact and may result from:

(a) An expressed disclaimer.

(b) Actual voluntary abandonment either before or after application for patent.

(c) Two years public use or sale prior to application for patent.

(d) Publication over two years prior to application for patent.

(e) Application for patent in foreign country by inventor or party in privity with him more than 12 months prior to filing United States application.

(f) Lack of diligence in filing application.

(g) Lack of diligence in prosecuting application.

(h) Disclosure but failure to claim in application.

(i) Cancellation of claims in application.

(j) Failure to pay final patent office fee after allowance of patent.

(k) Purposely keeping the invention secret for a long period of time prior to application for patent, thereby attempting to defer and in effect prolong the term of the patent grant.

(To be continued.)

Importance of Tool Engineering to the Automotive Industry

• *By* **W. S. KNUDSEN**
Executive Vice President, General Motors Corporation

As given before Detroit Meeting of the American Society of Tool Engineers, January 9th, 1936.

The speaker was introduced by Robert M. Lippard, President of American Society of Tool Engineers. Mr. Lippard spoke as follows:

In introducing our speaker this evening, I feel that I am introducing a man that you probably all know. You know him as one of the chief executives of our great General Motors Corporation. You know him as the former President of the Chevrolet Motor Company. You know him as a man that has been connected with the automotive industry since the early days of its development. I am not going to introduce that man to you because, as I said, you all know him. I want to introduce to you a Tool Engineer, a Tool Engineer of the highest rank; a man that was working at the Tool Engineering profession before the name 'Tool Engineer' was ever coined. He is well grounded in the fundamentals of Tool Engineering. The experience he has gained during those long years have fitted him ideally to carry on the work of organization and management that he is doing today. I do not believe it would be possible for us to find a man that could talk on the subject "The Importance of Tool Engineering to the Automotive Industry" better than our speaker tonight. It gives me great pleasure, and it is a real privilege to introduce our good friend and fellow Tool Engineer, Mr. William Knudsen.

Mr. Knudsen:

What a night this turned out to be! First, I am entertained with songs from my native country. I see in this assembly representatives of every place where I have worked and then I am introduced as a Tool Engineer!

About the time I started to rub my nose into the mechanical end of the business, there were no Tool Engineers. Some of the gentlemen here, who used to work with me in Buffalo, will remember we did not know what such a gentleman looked like. The first intimation we had of it was when I went out into the tool room one day and picked up a lot of slips of paper that were scattered over the floor by the tool makers, who were the aristocrats. They spent a lot of time making notes on a piece of paper. I gathered all these pieces up, took them to the office and flattened them out and then I found out that this deep mathematical problem that these men were trying to work out was to add a quarter and five thirty-seconds and three sixteenths together. This company was just about three steps ahead of the sheriff and we could not afford to pay sixty-five or seventy cents an hour for that kind of arithmetic, so I got hold of the boss and asked him if he thought he could do something—buy some adding machines so we could save some time. The result was he hired a boy, a mechanical engineer, and started what he called a tool drafting department. There was my first introduction to putting tool work on paper. Previous to that we worked from the finished piece and the tool maker, so called, was supposed to lay out his own operation. You just got what he handed to you. Somtimes it was good and sometimes not so good. Since then, I have seen the science of tool making develop and I am frank to tell you that without it in its present state the motor car business would be, to use a famous expression, back in the horse and buggy days. I do not think I can sketch it any better than to tell you a little bit about the motor car business.

I worked for a plant that early entered the parts manufacturing business. The organization was looked over by a famous citizen of Detroit, who finally bought the place and moved it to Detroit and we became a part of a very great organization. Up to that time we tried our hand at making most any kind of parts most any kind of way, at most any kind of price, but the amount of experience we had gathered by the cut and try method was such that when we were placed into a big organization and got the facilities that were necessary to bring that experience to work, we became refitted, so to speak, into that organization, I might say, like a glove. Most of the men who worked with me at that time were scattered in different parts of the plant and I think it is a great compliment to them and to the firm that employed them that they are still scattered throughout the firm and still respected for what they know. We thus arrived into the motor car business, and it was a hot one those days.

The first motor cars that were made were delivered to the public, more or less, in the experimental stage. The dealer did not know what to do with them. The customer did not know what to do with them. He bought a car and a lot of grief and was very philosophical, because if he did not like it there were ninety-seven others to choose from. He would always go and try another one. The greatest asset the motor car business has ever had was that people like to ride. They do not like to walk, and that particular fact, footed the bill of most of the the early days. The public seemed to be only too experimental expense in the motor car business in the early days. The public seemed to be only too happy to hand over the price of a new motor car, and in those days there were not any used cars, because when you got through with it, it was ready for the junk pile. Sometimes I wonder if we should not have a little bit of that nowadays, then we would not have the same thing happening as we have over on Livernois Avenue (in Detroit).

However, after the experiment was staged and had run its course, half of the firms going broke, and the other half, some of them successful and some of them not; somebody had invented the idea that a motor car should always be bought for cash. Consequently, people had mony to spend for improvement and there we entered what I would call the "quantity stage" of motor car production. I

would say this stage lasted from about 1913 until 1929. The War which intervened in there, brought into everybody's mind the idea that you had to make more of everything. It made no difference whether you were making airplanes, boats, or tractors; you had to make a lot of them. This particular city of ours rose to the idea. Consequently, when the War was over and the motor car business started up again, we immediately set out to make a lot of motor cars, and we did.

If you think of the years between 1920 and 1929, you will remember that all we heard was that we were making so many a day. I remember being told to rig up for two thousand a day, then for four thousand a day, and finally we were talking about eight thousand a day, and finally the Lord stepped in and stopped the parade. Nineteen twenty-nine came along and there we sat with great big establishments and not much to do. I can remember one prominent manufacturer who said, "We will never make two thousand cars a day again." He was wrong in the first place and in the second, but that is what happened. The so called "depression"—I refer to it as a "recession"—got hold of things. People had less money to spend for motor cars. Consequently, the main part of the business drifted down into what we call the "low price field," the lowest-priced motor car. Inasmuch as all the temptation was directed at the buyer from the low-priced motor car field, we had to start in and refine the lowest-price car. Materials were getting cheaper; wages were falling and we had two ways we could go with the motor car business. We could either make the same car for less money or a better car for more money. The industry chose to make a better car for the same money, with the result that during these years, from 1929 to 1933 or 1934, you saw within the low-price field the greatest step forward in motor car construction. There was the only place to get the business. In the year 1933 the percentage of motor cars in the low price field that were sold rose to somewhat over ninety per cent—a little bit over—consequently, other motor cars had to split ten per cent between them. Now, this was an awfully good thing because it put everybody in the middle, and the prograss that was made in the manufacturing of motor cars during these four years would, I say, be greater than was made the previous ten years, because after the four years had passed you bought in a low-priced motor car everything you had in a high-priced car four years previously, with the exception of size and certainly that got big enough. So, all the brains in the motor car business set to work to make the low-priced car better, and I can tell you gentlemen in all sincerity, that if it was not for the brains in the tool making part of it, it would not have been possible.

It is true that in doing this, with materials as cheap as they were, we, to a certain extent, left a little too much cast iron in there and not quite enough brains, if you know what I mean, but I think time will take care of that because we are not all engaged in further perfecting the lower priced field. Some are trying to tempt people to buy something a little better, so as to get our facilities fully in operation. So, the men in the tool room who years ago came to work with a scale and a pair of dividers have gone, and in their stead we have the gentleman with the "mikes", now. The only thing that will make an article attractive and low in cost is *accuracy*—nothing else.

It has been my experience, through the last hectic years, of having been put on the "pan" once in a while by gentlemen with little experience and a badge inside of their coat, who tried to tell me that the conveyor in the automobile factory was what was producing the work; that all we needed to do—we men who were running the factories—was to go and speed the conveyor up a few feet and then we would get more work. Well, I think we have had some experience with that. During the War we had some of these gentlemen come in and we used to finish the work out in the yard. So, it dawned on some of the speed merchants that it cost a little more money to do it that way than it did to do it right in the first place, so, as I look at the industry today, the foundation of the industry is—*accuracy*. You gentlemen are the men who produce the accuracy. You produce the fixtures and dies. Naturally, we get an odd one once in a while. You know what Kipling said, "If you took all the women in the world and split them in two parts you would find one-half was spoiling the men and the other half was bringing them back again." I am afraid there have been single incidents of tool design that would fall into the same category.

I think, sometimes we have needed two-thirds to bring it out again after one-third had spoied it. A very amusing incident comes to my mind. It was only a few years ago. Everybody had a passion for single purpose machines. We all know what that is. You do not change models very often. A single purpose machine is a fine thing. In a particular

(Continued on page 20.)

• This is a part of the enthusiastic gathering of Tool Engineers who attended the January Meeting of A.S.T.E. in Detroit.

SOLID OF REVOLUTION METHOD FOR
CALCULATING DIE BLANKS

By O. B. JONES

If the plane MOP in Fig. 11 is revolved about the vertical axis VV in Fig. 12 located 6 units from, and parallel to, MP its radius of revolution is $6 + 1 = 7$. Its mean circumference is 14 Pi, and its volume $V = 12 \times 14\ Pi = 168\ Pi$ cubic units.

The formula ordinarily prescribed for finding the volume of a frustrum of a cone involves square root. Using the solid of revolution method, the volume of the frustum of the right circular cone in Fig. 13 is obtained by first finding the volume of the right circular cylinder in Fig 14, 12 units in diameter by 8 units in altitude and adding to this the volume of the remainder of the frustum shown in Fig. 15.

The volume of the cylinder is $6 \times 8 \times 6\ Pi = 288\ Pi$ cubic units. The volume of the remaining portion shown in Fig. 15 is $3 \times 4 \times 14\ Pi = 168\ Pi$ cubic units. The total volume V of the frustum is $288\ Pi + 168\ Pi = 456\ Pi$ cubic units.

To find the volume of the sphere in Fig. 16 by the solid of revolution method, we first find the center of gravity of the semi-circle which is rotated on its diameter D in Fig. 17 to generate the sphere.

The volume of a sphere is $1/6\ Pi\ D^3$. The area of the semi-circle is $1/8\ Pi\ D^2$. The mean circumference (circumference of revolution) is 2 Pi X. The volume V of the sphere is, by the solid of revolution method, $V = (1/8\ Pi\ D^2)\ (2\ Pi\ X) = \frac{Pi\ ^2D^2X}{4}$. Forming an equation of the volume as found by the more commonly used method ($1/6\ Pi\ D^3$) and the volume as found by the solid of revolution method $(\frac{Pi\ ^2D^2X}{4})$ we have $1/6\ Pi\ D^3 = \frac{Pi\ ^2D^2X}{4}$. By solving this equation it is seen that the center of gravity of a semi-circle is located a perpendicular distance $X = \frac{2D}{3\ Pi} = \frac{4R}{3\ Pi} = .4244\ R$ from the diameter D.

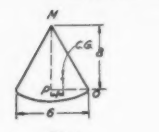

FIG. 11

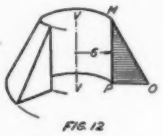

FIG. 12

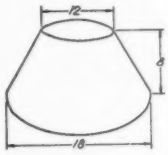

FIG. 13

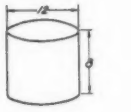

FIG. 14

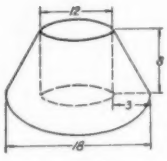

FIG. 15


FIG. 16

FIG. 17

FIG. 18

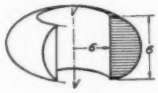

FIG. 19


FIG. 20

FIG. 21

FIG. 22

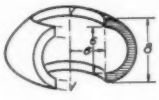

FIG. 23

To find the volume of the sphere in Fig. 18 we first determine the distance the center of gravity of the rotating semi-circle is from the center of the sphere by the formula just developed. $X = \frac{2D}{3\ Pi} = \frac{2 \times 6}{3\ Pi} = \frac{4}{Pi}$. The mean diameter of the sphere is $2X = 2 \times \frac{4}{Pi} = \frac{8}{Pi}$. The mean circumference (circumference of revolution) is $\frac{8}{Pi} \times Pi = 8$. The volume V of the sphere is the product obtained by multiplying its mean circumference by the area of its semi-circle, or $V = 8\ (\frac{Pi}{8} \times 6^2) = 36\ Pi$ cubic units.

If the semi-circle of the sphere in Fig. 18 is revolved about the vertical axis VV located 6 units from, and parallel to, the vertical diameter of the semi-circle as shown in Fig. 19 its radius of revolution is $6 + \frac{2 \times 6}{3\ Pi}$. The mean circumference is $(6 + \frac{2 \times 6}{3\ Pi})\ Pi = 6\ Pi + 4$, and its volume $V = (6\ Pi + 4)\ (1/8\ Pi \times 6^2) = 27\ Pi^2 + 18\ Pi$ cubic units.

To find the volume of material in the walls of the hollow sphere in Fig. 20 by the solid of revolution method we first find the dimension X, in Fig. 21 locating the center of gravity of the semi-circular plane figure formed by the two concentric 180° arcs.

The volume of a hollow sphere is $\frac{Pi}{6}\ (D^3 - d^3)$. The area within the two semi-circular arcs is $\frac{Pi}{8}\ (D^2 - d^2)$. The mean circumference (circumference of revolution) of the hollow sphere is 2 Pi X. The volume V of the walls of the hollow sphere is, by the solid of revolution method, $V = \frac{Pi}{8}\ (D^2 - d^2)\ (2\ Pi\ X) = \frac{Pi\ ^2X}{4}\ (D^2 - d^2)$. Forming an equation of the volume as found by the first method, and the volume as found by the second method, we have $\frac{Pi}{8}\ (D^3 - d^3) = \frac{Pi\ ^2X}{4}\ (D^2 - d^2)$. Solving this equation for X, the perpendicular distance from the diameter to the center of gravity of the plane figure which by rotation would generate the hollow sphere, we find $X = (\frac{2}{3\ Pi})\ \frac{(D^3 - d^3)}{(D^2 - d^2)} = (\frac{4}{3\ Pi})\ \frac{(R^3 - r^3)}{(R^2 - r^2)} = .4244\ \frac{(R^3 - r^3)}{(R^2 - r^2)}$.

To find the volume of the hollow sphere in Fig. 22 we first determine the location of the center of gravity of the area of the plane semi-circular figure bounded by the two concentric 180° arcs as follows: $X = (\frac{2}{3\ Pi})\ \frac{(8^3 - 6^3)}{(8^2 - 6^2)} = \frac{592}{84\ Pi}$. The mean diameter of the hollow sphere is 2X, or $\frac{592}{42\ Pi}$, and its mean circumference is $(\frac{592}{42\ Pi})\ Pi = \frac{592}{42}$. Its volume is the product of its mean circumference and the area of the rotating plane or, $V = \frac{592}{42} \times \frac{Pi}{8}\ (8^2 - 6^2) = \frac{148\ Pi}{3}$ cubic units.

If the generating plane (a half cross-section) which was rotated to produce the hollow sphere in Fig. 22 is revolved about the vertical axis VV in Fig. 23 located 6 units from, and parallel to the vertical diameter of the two semi-circular arcs its radius of revolution is $6 + X = 6 + \frac{592}{84\ Pi}$. Its mean circumference is $12\ Pi + \frac{592}{42}$ and its volume $V = \frac{Pi}{8}\ (8^2 - 6^2)\ (12\ Pi + \frac{592}{42}) = 42\ Pi^2 + \frac{148\ Pi}{3}$ cubic units.

(To be continued.)

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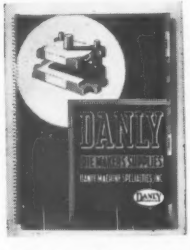

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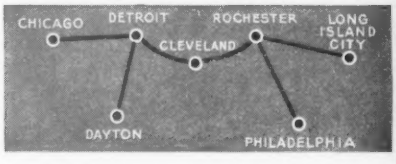

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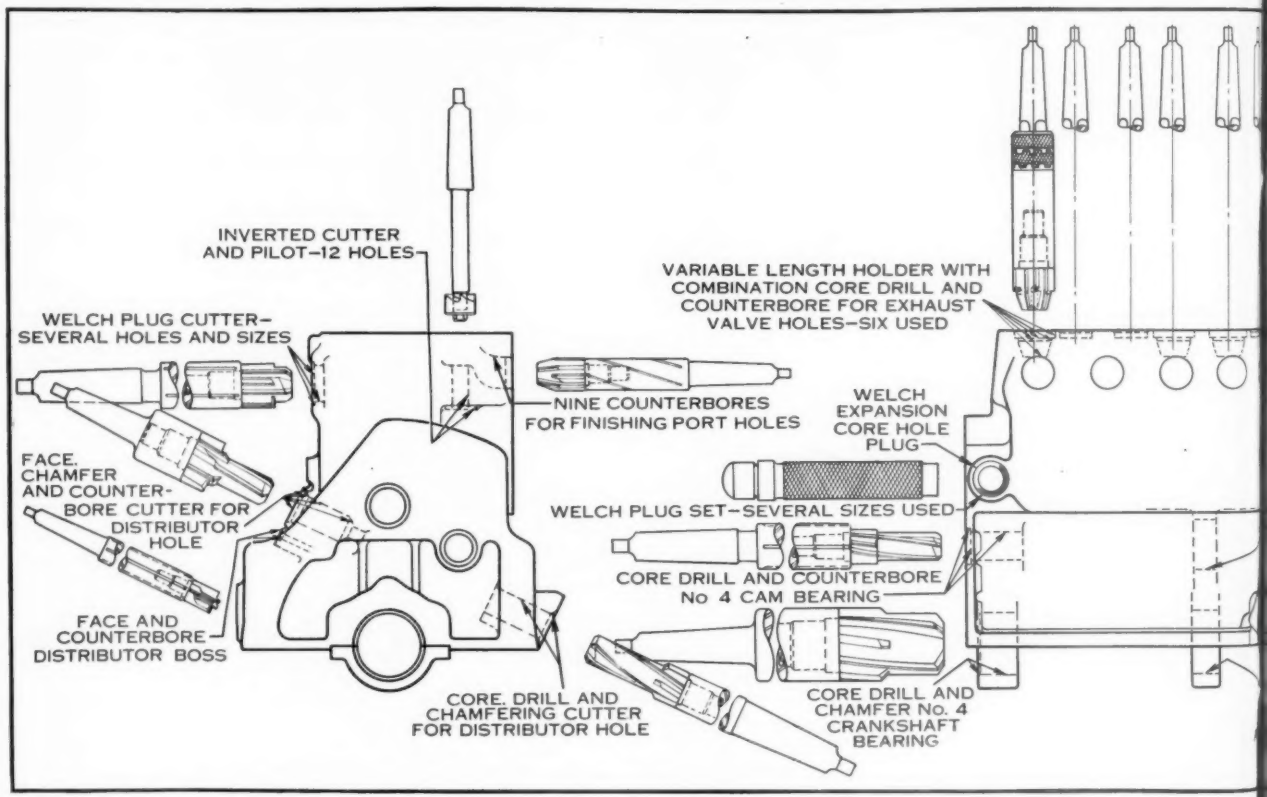
Tools of the interchangeable type are rapidly gaining favor where high production schedules must be maintained without interruption, and where minimum tool operation costs are imperative. One typical example is the Eclipse variable length holder used in multiple spindle operations, permitting not only instant detachability of cutting member but also eliminating the necessity of keeping cutters sharpened in sets of the same exact length.

Solid type tools used in high production operations (shank, cutter and pilot—one piece), often cause delay in removal and time lost for resharpening. When broken or worn out, replacement of the entire tool is necessary, whereas Eclipse interchangeable tools require replacement only of the worn section. The saving in ultimate tool cost, time and labor, when using quick detachable interchangeable tools, is obvious.



Operations similar to those outlined here may be found in your own plant and we ask you to take advantage of our engineering service. Acquaint us with your problems and we will gladly work with you—no obligation.

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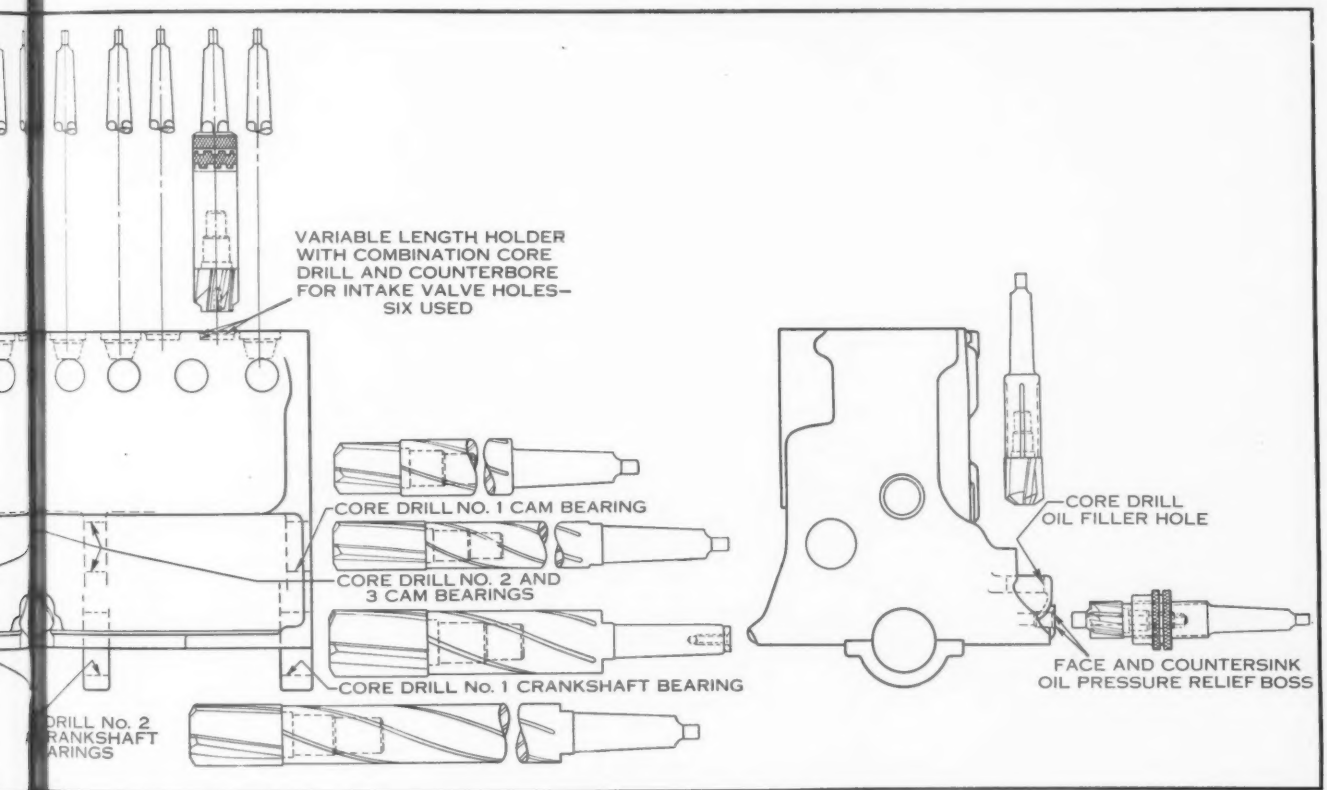
The Automotive Industry has probably brought about more changes in production methods than any other single industry. In the machining of alloy steel and cast iron parts of varying shapes, tools of correct design, proper hardness and maximum cutting qualities are demanded. The automobile cylinder block has many ideal operations where Eclipse quick detachable tools are being used with decided economical advantages.

Pictured below is an outline of a motor block together with a number of typical Eclipse high production tools used in spotfacing, counterboring, core drilling and chamfering operations These and similar tools are all designed and manufactured entirely in the Eclipse factory. Their accurate and efficient performance and the economies they have effected are matters of record and can be duplicated on similar operations in your plant.



Many interesting and instructive production operations are illustrated and described in our catalog No. 35, which will be sent you upon request on your firm's letterhead.

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A. S. T. E. Chapter News

CLEVELAND

Cleveland's first regular meeting of the American Society of Tool Engineers, was an open dinner meeting. Dinner was served promptly at 6:30 p.m. Among visitors who attended were the following: A. A. Merry, Carboloy Company, Col. V. A. Root, Seneca Falls Machine Company, E. F. Ross, Associate Editor "Steel" and R. A. Fintz, Superintendent of Vocational Education, Cleveland Board of Education.

Ferdinand Jehle, Research Engineer, White Motor Company, who addressed January Meeting of Cleveland A.S.T.E. Chapter.

On this occasion Mr. Fintz, Cleveland Chapter Chairman, was presented with a gold emblem in appreciation of his services to the Chapter. Mr. E. F. Mason won a free dinner ticket for the next dinner meeting at a prize drawing. Mr. Fintz welcomed members and guests and gave a brief history of A.S.T.E. and told some of the future plans of Cleveland Chapter. Mr. Ferdinand Jehle, Research Engineer of the White Motor Company, was the speaker of the evening and addressed the gathering on the relationship of research to Tool Engineering. Committee Chairmen gave reports, including Mr. Charles A. Kottersall on meetings and Mr. Paul Zerkle on entertainment.

DETROIT

Detroit Chapter's January meeting was very well attended—some five hundred Tool Engineers and their guests attending. W. S. Knudsen, Executive Vice President of General Motors Corporation, was the guest speaker and spoke in terms and on phases of production that clearly struck "home" to the interested audience. A feature of this occasion was the music rendered by the Nordic Concert Orchestra. Mr. Knudsen's highly interesting talk is reprinted elsewhere in this issue.

Committeemen of the Detroit Chapter are busy these days. Robert Lindgren, Chairman of the Membership Committee reports a goodly number of new applications for membership. The A.S.T.E. Standards Committee has passed or has pending a number of new Standard Tool Engineering Data Sheets.

Ford Lamb, A.S.T.E. Vice President has been fishing "through the ice" with a "moderate degree of success" he states. His fishing was done on a lake near Pinckney, Michigan. Henry Bockram, A.S.T.Eer of Detroit has announced the formation of the B. H. Tool & Supply Company located at 5521 Woodward Avenue in Detroit. The new company will handle the products of Mr. Bockram's former connection—Cleveland Twist Drill & Tool Company. Mr. T. E. Gallagher is new Manager for the latter's branch in Detroit.

Joe Whipple, A.S.T.Eer of Detroit Chapter has left Kelvinator to join the Consolidated Tool Company of Rochester, New York.

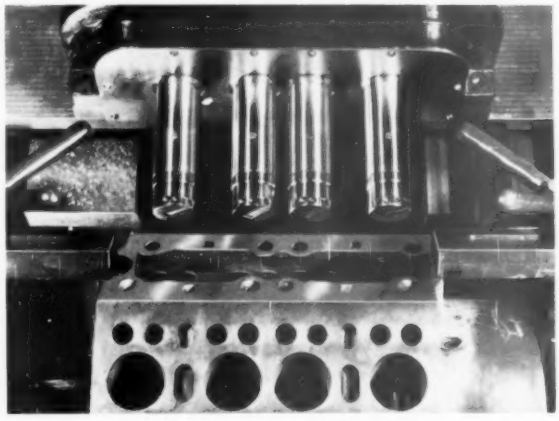
RACINE

January meeting of the Racine Chapter of the American Society of Tool Engineers was held Monday evening, January 6th, about one hundred Tool Engineers and Production Executives attending. Mr. H. D. Hiatt, Chapter Chairman, opened the meeting and gave a history and explanation of the purposes of the national organization of The Society.

The main speaker of the evening was Mr. Frank Curtis, Manager, Firthite Division of the Firth-Sterling Steel Company, McKeesport, Pennsylvania, manufacturers of sintered tungsten and tantalum carbides. His subject was "Sintered Carbides and Tool Engineering." Mr. Curtis drew attention to developments of recent years in the manufacture and handling of tools. A part of his talk was illustrated with stereoptican slides, showing lathes, tools, machines and practical applications of sintered carbides. Mr. Curtis also had on display a number of sintered tungsten cutting tools. An informal discussion was held after the meeting, during which Mr. Curtis answered a number of questions.

A number of applications for membership in A.S.T.E. have been received among them are those of Messrs. Robert L. Benson, Raymond J. Forkner, Halvor Anderson, Duncan Howard and Harold Eckmann.

PRECISION BORING



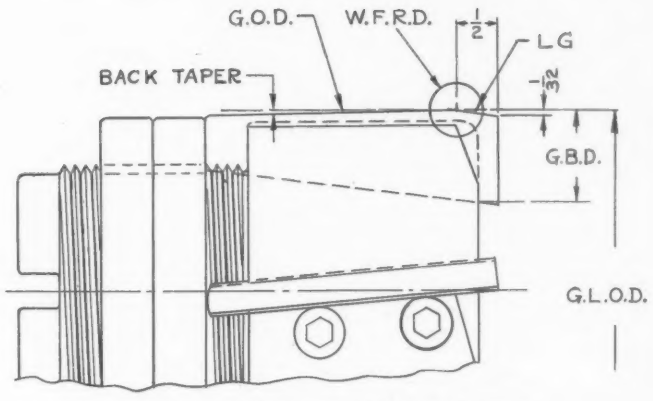
Precision Boring hard cast iron cylinder blocks on Ex-Cell-O Heavy Duty P.B. Machine. Tolerance .0003" maximum for round, straight and surface variations over a 6" length of cut.

MACKRAE MADE DETROIT MANAGER FOR GREENLEE

A. Eggars, Sales Manager for Greenlee Brothers, Rockford, Illinois announces the appointment of J. M. MacKrae as Manager of a new office for the Detroit area.

Mr. MacKrae is not a stranger to A.S.T.Eers of the automotive industry, having represented other well known manufacturers there. The new office was opened December 1st.

MORE ALPHABET SOUP



A typical grind is shown which meets the great majority of cases for accuracy and finish.

W. F. R. D. = **Where finishing reamer dulls:**

G. L. O. D. = **Grinding life on diameter = .250″ on 2″ Reamer.**

L. G. = **Lead grind = 125 Grinds on 2″ Reamer.**

G. O. D. = **Grinds on diameter = 62 Grinds on 2″ Reamer.**

G. B. D. = **Greatest blade depth (Blade has greatest support where actual cutting is done.)**

These figures are based on grinding twice on the lead, removing .015 stock per grind, to each grind on the O.D. removing .004 per grind.

***This varies with the size of the reamer, the standard 6″ size having 5/8″ grinding life on diameter.**

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is such that the blade length does not change throughout its life and therefore it is never necessary to "cut off" the blades because they extend too far beyond the body.

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DETROIT

PRODUCTION PERSPECTIVES

(Continued from page 10.)

Exposition. The Romance of Industry and the history of iron and steel manufacturing will be brought out through elaborate and extensive exhibits. The **Exposition** has **already** been **underwritten** by Cleveland manufacturers and business men **for a million dollars.** The **American Road Builders Show** held in Cleveland January 20 to 24 **indicated a more extensive use of Diesel engines and pneumatic rubber tires in road building equipment.**

Production of eight million new type piston rings was **started late in January by** the **Perfect Circle** Corporation **of Hagerstown, Indiana. Basca Manufacturing Company, Indianapolis,** Indiana **recently purchased the Houdaille Hershey Corporation plant** at 3019 Roosevelt Avenue in order to provide larger quarters for the company's manufacturing operations. Seven buildings and a power plant were involved in the transaction, but it was not learned whether or not new equipment would be purchased. **Fairbanks-Morse Home Appliances,** Inc. is **transferring manufacturing** activities **from Chicago to** the **Indianapolis** plant of the parent Fairbanks Morse Company on Northwestern Avenue at 21st Street. The Home Appliances subsidiary **will manufacture radio sets** and **electric refrigerators.** From **Kokomo, Indiana** we hear **employment** has been provided **for 1000 to 1400 persons a day** as **production of radios has reached a new high** of **3000 sets per day** in the new factory of the **Crosley Radio Corporation** located in the former Haynes automobile plant. Production of the Crosley radios in this plant is on a continuous line basis. At **Muncie, Indiana, Warner Gear Company** recently **completed** an **addition to its No. 3 plant** as a further step in a program of expansion. The **total expenditure** of which will reach **$1,350,000** when completed. Since the first of the year approximately **3000 employees** have been at work **in the Muncie plants** of this company.

Contracts for the construction of a **large new General Motors Assembly plant in Los Angeles** have been **let** and **work started,** General Motors officials recently announced. The new plant is to occupy a forty acre tract at Alameda & Tweedy. The new plant is to be known as the Argonaut Manufacturing Division of the General Motors Corporation. Assembly of Pontiac, Oldsmobile and Buick automobiles for Pacific Coast delivery is the chief function of the new plant.

Production in the **new Michigan Tool plant,** Six Mile Road, **Detroit,** was **started February 8th.** The new plant is devoted primarily to the production of machine tools including gear finishing and lapping equipment and gear testing equipment.

IMPORTANCE OF TOOL ENGINEERING TO THE AUTOMOTIVE INDUSTRY

(Continued from page 13.)

factory where I was working at the time, we had such a machine. It was a "bird." We had a piston turning machine, and without any question of doubt, it could turn out more pistons than anything I ever saw, but it was not running all the time. Whenever you looked at it, it was over in the tool room. So we got up against it, like you always do, and one of us went over and bought a flock of small lathes and we got them going. By and by the boss came around and said, "Who did this?" I said, "I did." He said, "What did you do that for?" I told him, "That damn thing is never running." "It takes four tool makers to keep it running, and these lathes did not cost as much as this one machine." He says, "Throw the damn thing out anyhow." Now, I only bring this up, not to be funny about it, but to remind you that after all, it is the final result that counts. Do not build a device that is too fancy. Build one that will get the work out. I remember a tool designer, I think he is retired now, but there was one thing about him, when he built anything, it would last. Consequently, the production went up. A fixture like that, even if it costs money, is worth four or five flimsy ones. I always think back to the amount of money that this old gentleman really saved the compnay he was working for by making them stout to begin with.

I suppose, having covered pretty well what has happened up to now, I could be allowed to digress a little bit about what might happen in the future. I have no doubt in my mind that people will still like to ride. I have no doubt in my mind that the motor car business is with us for a long time to come. I am sure, however, that people will want to get something better out of motor cars than they are getting now. I think that the progress we have made will be very small compared to the progress we will have to make during the next decade. I am quite satisfied that the development of a motor car will lie in the direction of lower maintenance cost when a car is running. I think we all owe the Petroleum Institute of America a great deal of credit in improving the fuels. With the improved fuels we will be able to get higher compression. You know what that means. It means that you have got to remember not only what the elastic limit is but how far you can go beyond the elastic limit. That is going to be the trick and I want to tell you, in all sincerity, that I fell there is going to be more demand for ingenuity in working materials during the next ten years than you have ever been called upon to furnish before. We hear a lot about progress in engine manufacture and, naturally, the newer styles of engine designs in motor cars—I mean the forward styles which are perhaps not on the street yet. They are, to a great extent, influenced by the airplane engine. If I had some boys tomorrow, to bring up in the motor car business, I would send them over to work in a plane factory for a while because these gentlemen can give us a lot of ideas.

I am quite satisfied that the way to solve the used car problem is to give people better new cars. I feel that it is perfectly ridiculous that a man should buy a motor car and run it eleven months and trade it in on a new one because he thinks he is better off than he was. You have heard a lot of talk about the stabilization of the motor car industry. You know what has been done this year. You notice the effect. I think, as far as scheduling our stuff, we can go as far as anybody. We do not need anybody to tell us how. We know we can do it and we have the money, but you gentlemen have a great duty toward the industry in trying to help us to get better use of our materials during the coming ten years.

Mr. Kettering often says that the duty of an engineer is to transfer the science of formulae into

(Continued on page 26.)

Notable Features and Advantages In This Hydraulic Rigidmil

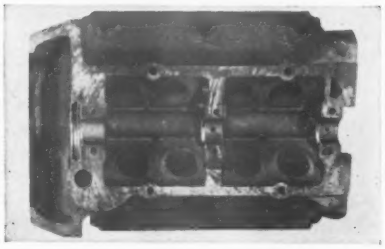


Fig. 1. Cylinder block in which bearings and oil-retainer groove are Rigidmiled.

THE WORK—Straddle-milling and chamfering main bearings, and milling oil-retainer groove, in cylinder block shown in Fig. 1.

THE MACHINE—A built-to-order Sundstrand Rigidmil with vertical hydraulic feed, hydraulic work-clamping, complete automatic lubrication, and built-in fixture; shown in Fig. 2. No flexible tubes are used in the hydraulic system; and automatic lubrication includes even the roller chain that connects the sliding head with its 2,000-pound counterweight.

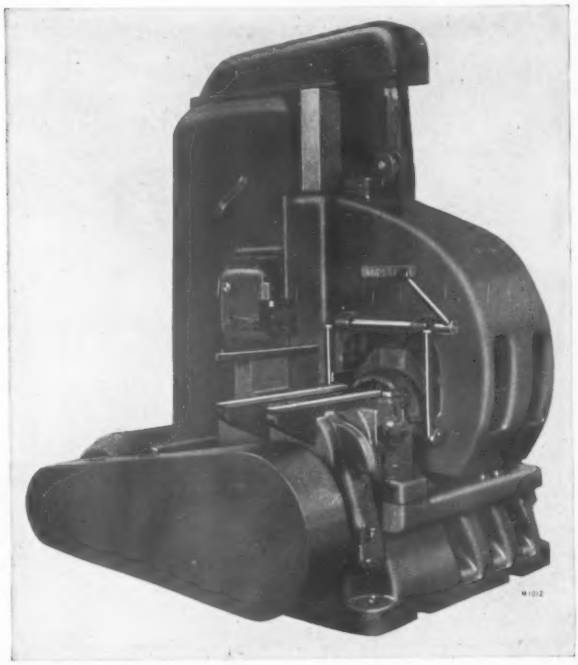


Fig. 2. Rigidmil with built-in fixture, hydraulic operating and clamping, automatic lubrication.

THE OPERATION—A cylinder block rests on conveyor-height hardened steel rails in front of operator. He slides the work-piece into the tunnel-type fixture which forms part of the machine slide at his right. Movement of three interlocked hand-levers in rapid succession now results in (1) lowering work-piece upon hardened and ground locating pins, and blocks; (2) hydraulic work-clamping, (3) starting the automatic cycle of rapid approach, feed, dwell, quick return, and stop. Machining completed, operation of first and second levers strips the work-piece from the locating pins and returns it to conveyor height. Milling is accomplished by a group of cutters on the rigidly supported arbor shown in Fig. 3. Of special interest are the cutters interposed between the straddle mills to remove any excess metal that might prevent successful completion of the milling operation.

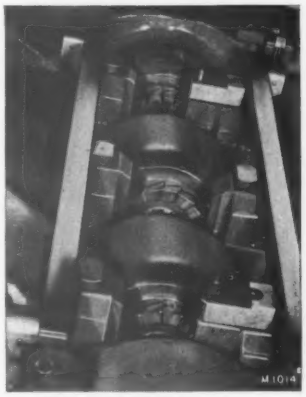


Fig. 3. Close-up of cutters and arbor supports.

This hydraulic Rigidmil is accurate, fast, powerful, durable, and easy to operate. Production data supplied promptly on request. Send us prints and data for reliable estimates on Rigidmiling your work.

NEW EQUIPMENT

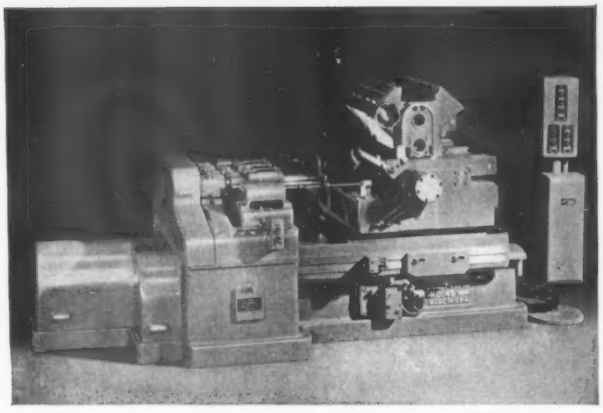
Stupakoff Comparator Microscope

Comparator Microscope: A new Comparator Microscope for use by tool makers for accurately measuring extremely small points on tools, dies and finished products and for use in inspection departments for checking purchased articles against required specifications, is now manufactured by Stupakoff Laboratories, Pittsburgh, Pa. The instrument consists of a 60-power microscope with an adjustable eye lense for focusing sharply on the cross lines on the microscope field and a movable carriage on which the objects are fastened. For complete description and applications of this instrument to particular industries, write Stupakoff Laboratories, 6625 Hamilton Avenue, Pittsburgh, Pa.

Jarvis Speedwitch Flexible Shaft Unit: This latest High-Speed Unit of the Charles L. Jarvis Company is equipped with ⅓ H.P. ball bearing electric motor, 18,000 R.P.M. The motor is mounted in a combination bench and overhead suspended base. The flexible shaft, a Jarvis product, is specially designed for High-Speed. The Hand Piece is all ball bearing equipped with special precision bearings for thrust as well as radial load, to be used with ¼" collets. The price of this unit is below $50.00. Inquiries should be addressed to The Charles L. Jarvis Company, Gildersleeve, Connecticut.

Tungsten Carbide Tipped Lathe Centers: This product has been added to regular production by the Tungsten Carbide Tool Company, Detroit. Formerly these items were produced on special order by this organization but demand as a result of enhanced operating achievements has caused them to be placed in routine production. Long life and minute wear of the tungsten carbide tips, it is claimed, enables maintenance of accuracy in production for finishing operations over long periods of time. For roughing, the new centers permit much heavier cuts.

Ingersoll Zee Lock Hollow Mill: The Ingersoll Zee Lock Cutter Blade is now applied to inserted blade adjustable hollow mills. This provides an adjustable inserted blade cutter where the inserted blades are held rigidly, but may still be adjusted to size, it is claimed. When completely worn, the blades may be renewed at only a fraction of the initial cost of the complete cutter. The housing of the tool is ground accurately to the specified body diameter, allowing the tool to be supported or piloted in a jig bushing or steady rest. The Ingersoll Zee Lock Cutter Blade used with the hollow mill may be of plain or super high speed steel, "J" Metal, Stellite, or Cemented Carbide. Inquiries should be addressed to The Ingersoll Milling Machine Company, Rockford, Illinois.



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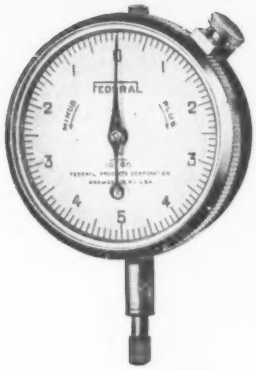

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Milling Cutter Power Requirements

By O. W. WINTER,
MEMBER A.S.T.E.

Manager Cutter Division Whitman & Barnes, Inc.

Editor's Note:

In the previous installment covering directions on how to use the charts, under "A. Unknown Factor" should have been "Feed Permissable" and not "Power Required."

Item 3, under Known Factors, instead of being "Feed in inches per minute" should have been "Power rating of milling machine." Hence, following the directions given from there on, the feed permissible with a machine of any size could be determined.

The example given for double cutter set up follows these directions. In order to obtain the power required for any given feed under any set of conditions the procedure would simply be reversed, that is as follows:

1. Select the feed on the feed scale and trace vertically to the intersection with the size of cut diagonal line or curve.
2. From this intersection point trace horizontally to the right to the intersection with the diagonal representing tooth contacts per minute for the job under consideration.
3. From this intersection point drop down to the scale representing horse power required of the cutters.
4. The total horse power required for a gang of cutters would be the sum of the power required for each individual cutter.

Following is a formula to use when it is desired to know the feed rate permissable when three or more cutters are to be used in a gang:

Three or more cutters—Figure as for two cutters the feed rate allowable for each were it working alone. The allowable feed rate for the group working together is approximately expressed by the formula—F equals $\frac{A+B+C}{n^2}$ etc.

1. A, B, and C represent the allowable feed for each cutter acting were it alone. One figure is needed for each cutter cutting at the same time.
2. n, equals number of cutters cutting at one time and represented in the numerator of the formula.

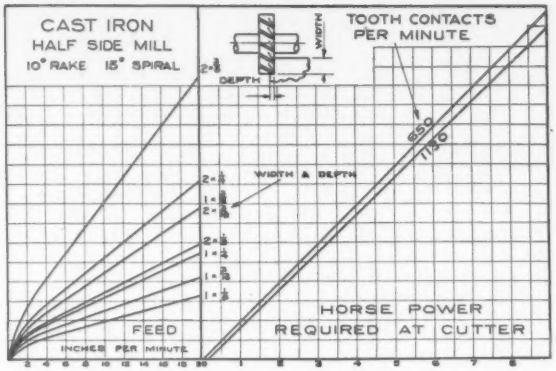
Another way to determine allowable feed rate is to assume a certain feed and determine the total horsepower required. The correct result should be obtained after two or three tries.

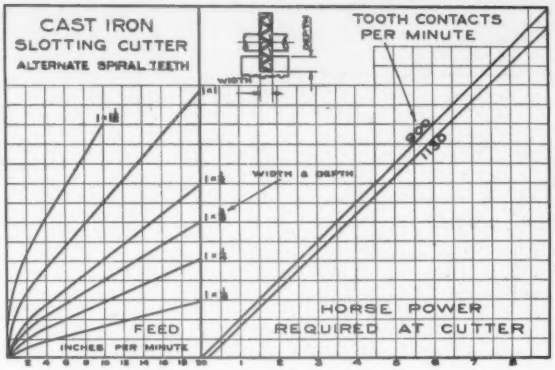
Note also that if any cutters in the group are identical as to the number of tooth contacts per minute and the width and depth of cut they are taking they may be assumed as one cutter. In this case the allowable feed rate for all identical cutters would be that for any of them divided by the number of these identical cutters. After this preliminary calculation is done figure for the rest of the cutters as explained above.

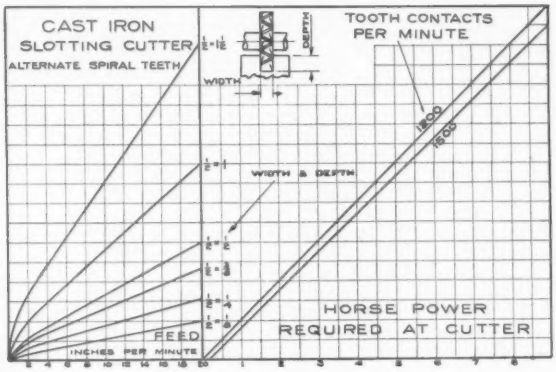
This may make some gangs of cutters actually containing more than two cutters be figured nevertheless as such, take the previous example for instance. If there had been 2 half side mills in the gang, the allowable feed instead of 19"/min would have been 9½"/min for the pair. The substitution in the formula then becomes

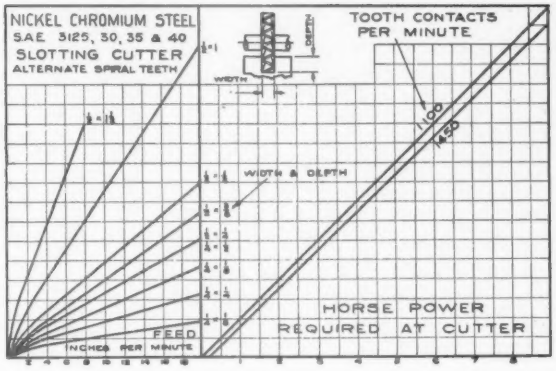
$\frac{17.5\times9.5}{17.+9.5}$ equals $\frac{166.25}{27}$ equals 6.15" min feed allowable

POWER REQUIREMENTS CAST IRON—NICKEL CHROMIUM STEEL



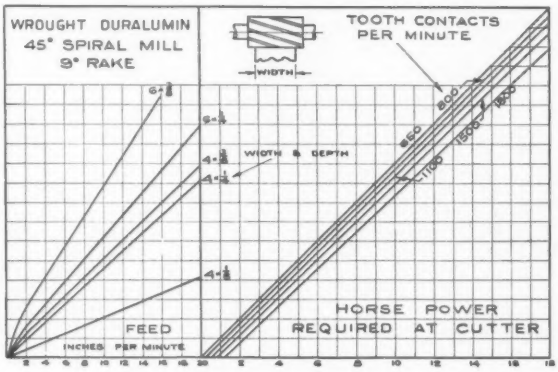


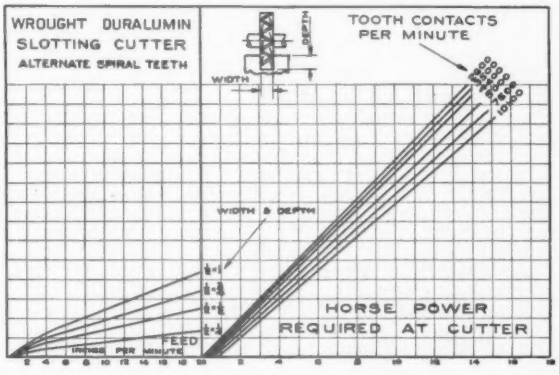


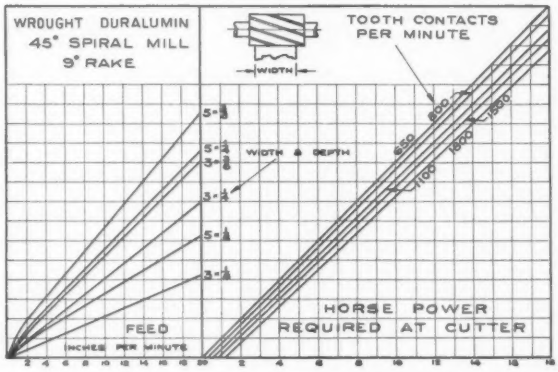


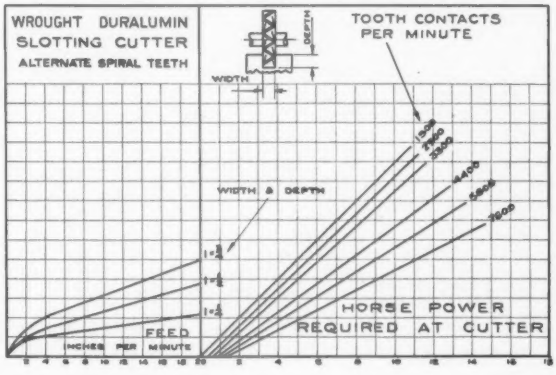
TEAR OUT AND FILE FOR REFERENCE

POWER REQUIREMENTS WROUGHT DURALUMIN









THIS MONTH'S COVER

COLORED LIGHTS FLASH ACCURACY OF PISTONS

High compression and increased power development make accuracy of pistons a matter of greater importance than ever. At the Dodge factory, in Detroit, engine pistons are tested in a number ways, one being that shown on this month's cover of *The Tool Engineer*. In one operation, the depth of the ring grooves as well as the uniformity of the lands is checked. In the background two banks of lights are seen — one bank for checking the grooves, one bank for checking the lands. White light indicates correct measurements. When the light is red, a deviation from standard dimensions has been located.

IMPORTANCE OF TOOL ENGINEERING TO THE AUTOMOTIVE INDUSTRY

(Continued from page 20.)

things,—into the science of things. Now, I have never seen a gentleman of formulae who was very handy in transferring this into things unless he had spent a certain amount of time in the shop. Consequently, in the shop, to the shop, you must look for the progress we are going to make. I talked to a professor the other day. He, in turn, talked to Mr. Kettering. In the American Academy of Science they had some discussion of problems that lie ahead of science during the next ten or twenty years. It was brought out that it was much better to turn our research towards more practical things, for this reason; that if you took the best two men you had, the best theorists known to science and had them lay out a set of gears on the board, there is one thing you could be sure of, when the gears were made they would not be any good. So, gentlemen, that is the thought that I would like to leave with you. You will hear a lot of theories. You will hear a lot of formulae advanced that have never been tried out before and will not be tried out again. I hope that with all your skill and all your experience you will help us to transfer the science of formulae into the science of things. There is only one thing that will make a country go forward and that is; *being able to produce better things at lower costs, so they will reach more people.* Thank you and good night.

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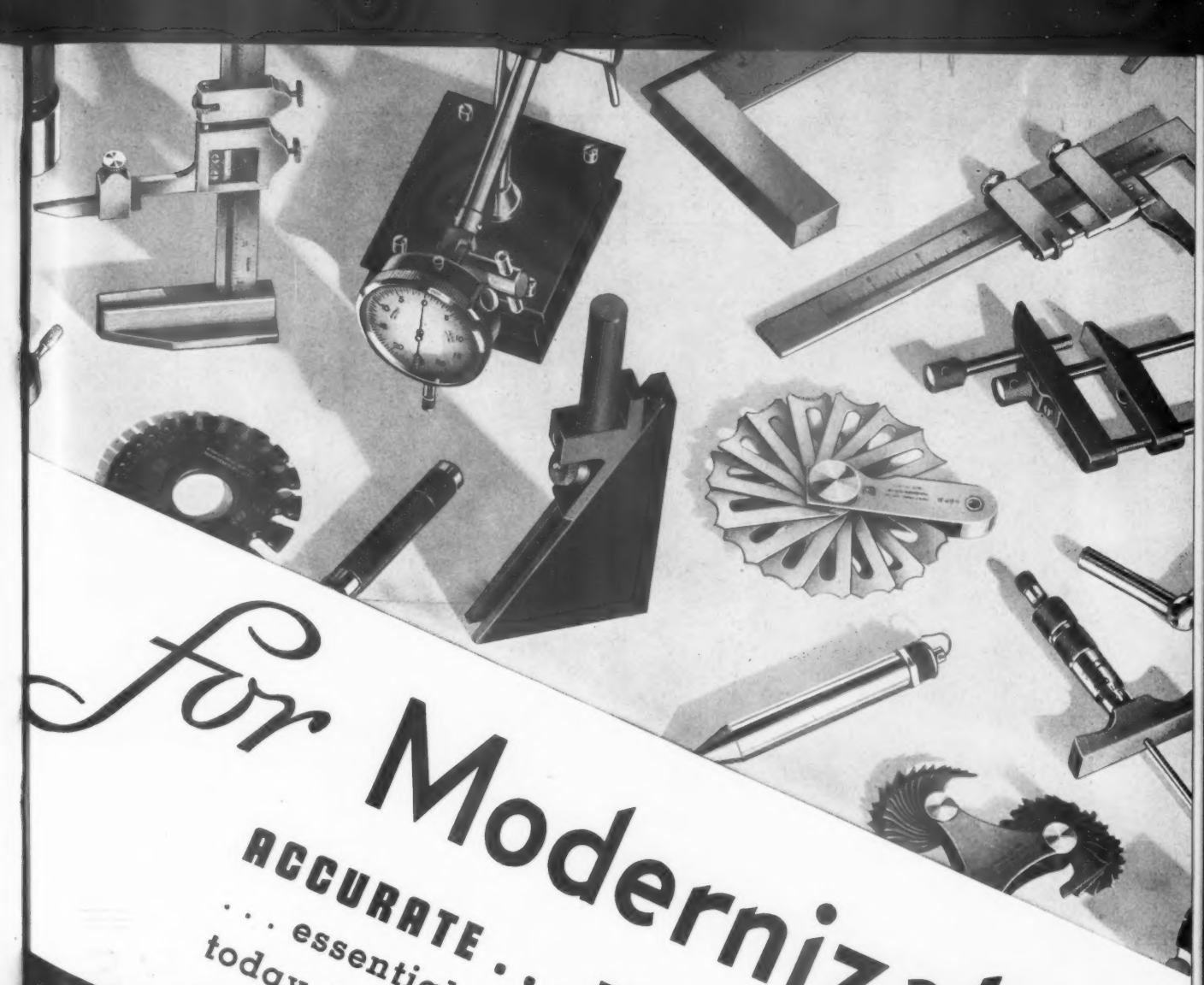

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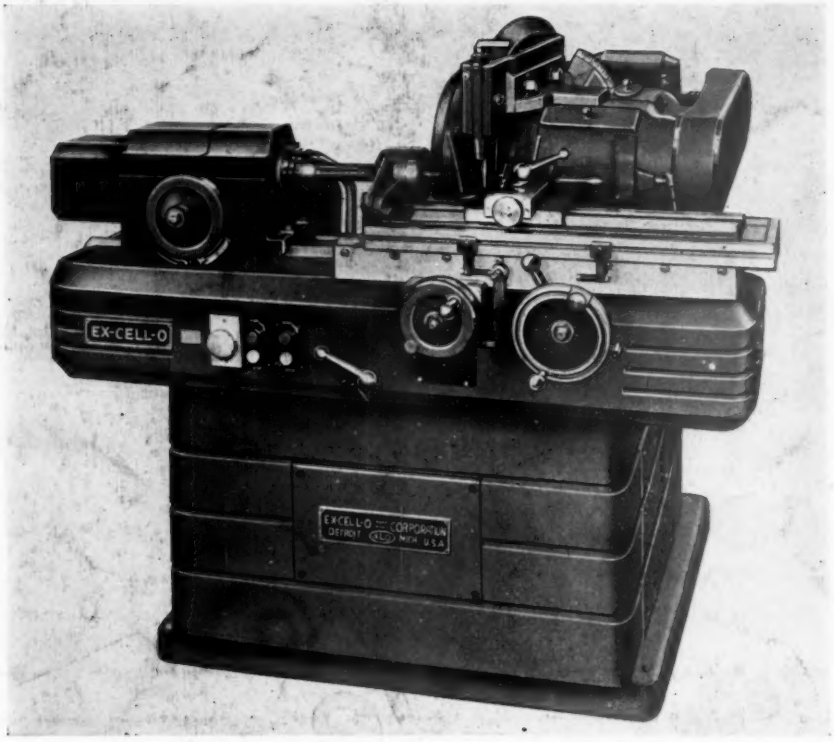

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